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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/594,075	08/14/2007	Sergei A. Svarovsky	NIHC-6039	2177

89858 7590 11/22/2010

Woodcock Washburn LLP
Ott-NIH
Cira Centre, 12th Floor
2929 Arch Street
Philadelphia, PA 19104

EXAMINER

HAQ, SHAFIQUL

ART UNIT	PAPER NUMBER
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1641

NOTIFICATION DATE	DELIVERY MODE
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11/22/2010

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

eofficemonitor@woodcock.com

Office Action Summary	Application No. 10/594,075	Applicant(s) SVAROVSKY ET AL.	
	Examiner SHAFIQL HAQ	Art Unit 1641	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 October 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 95-149 is/are pending in the application.
- 4a) Of the above claim(s) 99-149 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 95-98 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 April 2008 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>9/22/06 and 11/13/06</u> . | 6) <input type="checkbox"/> Other: _____. |

DETAILED ACTION

Response to Election/Restrictions

1. Applicants' election with traverse of Group I, Claims 95-98 filed October 15, 2010 to restriction requirement in Office Action mailed November 14, 2010 is acknowledged and entered. Applicants' election of sulfur atom as the single species of non-zinc linking group and an ethylene glycol group as the single species of a luminescent promoter is also acknowledged.

Applicants' traversal is on the grounds that US patent 6,306,601 does not pertain to quantum dots of present invention. With regard to the above argument, it is noted that in the office action of 9/14/2010, a wrong patent number was inadvertently cited (clerical mistake) in place of US 6,306,610 (Bawendi *et al*), which has been applied in the rejection of this office action and as described in the office action the reference clearly reads on claim 95 as claimed.

Accordingly, claims 99-149 are withdrawn from further consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

2. Claims 95-98 are examined on merits to the extent it encompasses the elected species..

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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4. Claims 95-99 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
5. As recited, the quantum dot comprises four components i.e. 1) a noncrystalline core; 2) a luminescence promoter; 3) a non-zinc linking group and 4) an ethylene glycol unit but however, as defined, the luminescence promoter can be selected from ethylene glycol unit and in that case how is the luminescence promoter be different from the component 4) i.e. the ethylene glycol unit? Moreover, the recites "an ethylene glycol unit linked to the surface of the nanocrystal core through the linking group" is confusing as to whether the "linking group" is intended for the "non-zinc linking group" or other linking group?
6. Claim 96 lack antecedent basis for the recitation "wherein the linking group does not comprise a group VA or VIA element which is present in the nanocrystal core" because the nanocrystal core of claim 95 does not recited to have group VA or VIA elements.
7. With regard to claim 97 it is unclear as to the formula XI is for further limitation of what component of the quantum dot of claim 95? It is unclear as to whether the group of formula XI represents the non-zinc linking group, the luminescent promoter or the ethylene glycol unit?

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 95, 96 and 98 are rejected under 35 U.S.C. 102(b) as being anticipated by Bawendi *et al* (US 6,306,610 B1).

Bawendi *et al* teach a quantum dot (col.4, lines 7-8) comprising a semiconductor nanocrystalline core exhibiting quantum confinement and having a band gap (col.4, lines 7-56 and col.6, lines 14-37); a luminescent promoter (e.g. alkylthio acid) linked to the surface of the nanocrystalline core and an ethylene glycol unit linked to the surface of the nanocrystalline core through a non-zinc linking group. See Biotin-Amine complex of Fig. 10 wherein an alkylthio acid (11-mercaptoundecanoic acid) (i.e. a luminescent promoter) is linked to the surface of the nanocrystalline core and an ethylene glycol unit is linked to the surface of the nanocrystalline core through a 11-mercaptoundecanoic acid (i.e. a non-zinc linking group).

With regard to claim 96, the linking group 11-mercaptoundecanoic acid does not comprise group VA or VIA element.

With regard to claim 98, Bawendi *et al* teach semiconductor nanoparticle comprising cadmium telluride (CdTe) (col.12, line 43 and col.13, line 41).

Therefore, the reference is deemed to anticipate the cited claims.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claim 97 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bawendi *et al* (US 6,306,610 B1) as described above and further in view of Duffy *et al* (US 2005/0250097 A1).

See the above teaching of Bawendi *et al*. Bawendi *et al* disclose water soluble quantum dots comprising binding pairs (col.7, lines 1-7) and a water-solubilizing group (col. 16, lines 11-14 and col. 19, lines 1-2) for detection of biological compounds (col. 19, lines 8-21 and col. 21, lines 5-65).

Bawendi *et al* disclose carboxylic acid containing group as water solubilizing group but however, do not disclose ethylene oxide terminated groups as water soluble group in the quantum dots.

Duffy *et al* teach array surface with immobilized binding pair for detection of analyte (paragraphs [0080] and [0081]). Duffy *et al* disclose monolayer surface comprising mixed self-assembled monolayer (SAM) comprising SAM that terminate in a chemical group capable binding to biomolecules and SAM terminating in chemical groups that is substantially inert toward biological molecules and the inert group comprises alkanethiol having short oligomer of

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ethylene glycol {e.g. tri-(ethylene glycol)} (paragraphs [0195], [2016] and [0217]). Duffy *et al* teach that the inert group reduce or eliminates non-specific adsorption/binding of proteins and biomolecules (paragraphs [[0216], [0232] and [0280]). Duffy *et al* further teach various surfaces suitable for immobilizing the SAM comprising alkanethiols (paragraph [0203]).

Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to consider the inert alkanethiol having short oligomer of ethylene glycol as taught by Duffy *et al* in the quantum dot of Bawendi *et al* with the expectation of providing Bawendi *et al* with biofunctionalized water-soluble quantum dots with reduced non-specific binding with a reasonable expectation of success because Duffy *et al* teach that SAM comprising alkanethiols are suitable for coupling to various surfaces and alkanethiol having inert group such as short oligomer of ethylene glycol {e.g. tri-(ethylene glycol)} reduce or eliminates non-specific adsorption/binding of proteins and biomolecules. Duffy *et al* teach short oligomer of ethylene group such as tri-(ethylene glycol) but however do not disclose di-(ethylene glycol) as short inert group as claimed in claim 97, but however, the compound of claim 97 and alkanethiol having tri-(ethylene glycol)} are homologs differing by one ethylene oxide repeat and homologs (compounds differing regularly by the successive addition of the same chemical group) are generally of sufficiently close structural similarity that there is a presumed expectation that such compounds possess similar properties. In re Wilder, 563 F.2d 457, 195 USPQ 426 (CCPA 1977).

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12. Claims 95-98 are rejected under 35 U.S.C. 103(a) as being unpatentable over Barrientos *et al* (Chem. Eir. J. 2003) in view of Lin *et al* (J. Am. Chem. Soc. 2002), Bruchez *et al* (Science 1998), Bawendi *et al* ((US 6,306,610 B1) and Zhang *et al* (J. Am. Chem. Soc).

Barrientos *et al* disclose gold nanoparticles functionalized with sugar ligands for detection of the ligand specific analyte (see abstract and Introduction). Barrientos *et al* teach providing sugar ligands on the surface of gold nanoparticles using self assembled monolayer (SAM) comprising alkanethiol derivatized with terminal sugar ligands (see page 1912). Barrientos *et al* teach providing water-soluble nanoparticles with different density of sugar ligands (see abstract) by incorporating SAM comprising terminal ethylene glycol units (page 1916, lines 3-6 on right col. and scheme 4B). The hybrid (mixed) SAM of Barrientos *et al* reads on the luminescent promoter (i.e. comprising ethylene glycol), a non-zinc linking group (i.e. thiol linker) and ethylene glycol unit linked to the surface through the linking group.

Barrientos *et al* disclose gold nanoparticles for functionalization with the ligand but do not functionalization of semiconductor nanoparticle having a band gap.

Lin *et al* disclose gold nanoparticles functionalized with carbohydrate ligands (see scheme 1). Lin *et al* teach that besides gold nanoparticles, semiconductor nanoparticle bioconjugates as selective fluorescent biological labels have shown great potential in biological studies and medical applications (lines 1-13, 1st col. on page 3508).

Bruchez *et al* teach semiconductor nanocrystals as fluorescent labels (see abstract). Bruchez *et al* teach that core-shell nanocrystals are advantageous for being capable of generating spectrally tuned family of probes. Bruchez *et al* also teach providing nanocrystals with different fluorescent emissions (e.g. green, red) by variation in the core size of the nanocrystals (lines 1-28, 3rd col. on page 2014 and second paragraph, 2nd col. on page 2015).

Bawendi *et al* disclose semiconducting nanoparticles with core-shell suitable for functionalization with SAM comprising thiols (see Fig. 10).

Zheng *et al* teach coupling of gold nanoparticles with thiolated ethylene glycol having different ethylene oxide repeats (e.g. 2, 3 or 4) and teach that mixed monolayer of ethylene glycol and a functional ligand eliminate non-specific interactions and provide specific interactions in the same time (lines 4-24, 2nd col. on last page).

Therefore, given the fact that semiconducting nanoparticles is an art recognized alternative to gold nanoparticles (Lin *et al*) and semiconducting nanoparticles are advantageous for being capable of generating spectrally tuned family of probes (Bruchez *et al*), it would be obvious to one of ordinary skill in the art at the time the invention as made to consider semiconducting nanocrystals to functionalize with the sugar ligands of Barrientos *et al* with the expectation of similarly providing sugar label tuned fluorescent probes with a reasonable expectation of success. The reasonable expectation of success comes from the teaching of Bawendi *et al* that SAM comprising thiol groups can be coupled to surface of semiconducting nanocrystals and from

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the teaching of Bruchez *et al* providing nanocrystals with different fluorescent emissions by variation of core sizes. Further, the Courts have ruled that art-recognized equivalence between embodiments provides a strong case of obviousness in substituting one material for another. See MPEP 2144.06.

With regard to claim 96, the linking group (e.g. -S-) does not comprise a group VA or VIA.

With regard to claim 98, Bawendi *et al* teach semiconductor nanoparticle comprising cadmium telluride (CdTe) (col.12, line 43 and col.13, line 41).

With regard to claim 97, Barrientos *et al* teach alkanethiol having short ethylene glycol (scheme 4, see gluco 5) but however do not disclose comprising di-(ethylene glycol) as claimed in claim 97, but however, the compound of claim 97 and alkanethiol having ethylene glycol are homologs differing by ethylene oxide repeat and homologs (compounds differing regularly by the successive addition of the same chemical group) are generally of sufficiently close structural similarity that there is a presumed expectation that such compounds possess similar properties. In re Wilder, 563 F.2d 457, 195 USPQ 426 (CCPA 1977).

Moreover, the length of the carbon chain (methylene group) and the number of ethylene oxide repeats have not been described in the specification as critical to the practice of the invention and the optimum carbon chain length (methylene group) and the ethylene oxide repeat suitable for a particular application can be optimized (Zheng *et al*) and thus is deemed merely a matter of judicious selection and routine optimization which

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is well within the purview of the skilled artisan and therefore obvious under 35 U.S.C. § 103(a).

Conclusion

13.No claims are allowed.

14.Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shafiqul Haq whose telephone number is 571-272-6103. The examiner can normally be reached on 7:30AM-4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark L. Shibuya can be reached on 571-272-0806. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Shafiqul Haq/
Primary Examiner, Art Unit 1641